

CLAIMS

What is claimed is:

1. A method of prioritizing voice service over data service in a wireless communication network, the method comprising:

monitoring a combined usage of a shared network resource by current voice and data users; and

if the combined usage exceeds a resource release threshold, reducing the combined usage by a desired amount by modifying ongoing service to one or more of the current data users.
2. The method of claim 1, wherein monitoring a combined usage of a shared network resource by current voice and data users comprises monitoring usage of forward link transmit power at a network radio base station.
3. The method of claim 2, wherein reducing the combined usage a desired amount by modifying ongoing service to one or more of the current data users comprises reducing a transmit power allocation for one or more of the current data users.
4. The method of claim 3, wherein reducing a transmit power allocation for one or more of the current data users comprises reducing the transmit power of a forward link channel associated with each of the one or more current data users.
5. The method of claim 3, wherein reducing a transmit power allocation for one or more of the current data users comprises reducing a data rate of a forward link channel associated with each of the one or more current data users.

6. The method of claim 3, wherein reducing a transmit power allocation for one or more of the current data users comprises reducing an encoding rate of a forward link channel associated with each of the one or more current data users.
7. The method of claim 3, wherein reducing a transmit power allocation for one or more of the current data users comprises changing a radio service configuration of each of the one or more current data users.
8. The method of claim 3, further comprising selecting the one or more current data users for reduction of allocated transmit power based on ranking the current data users according to a forward link power-to-data-rate metric and choosing a number of current data users in rank order to achieve the desired amount of reduction.
9. The method of claim 1, further comprising choosing a particular one or more of the current data users for modification of ongoing service according to an overall service objective comprising either a fairness objective that prevents over-penalization of any of the current data users to maintain data service fairness, or a throughput objective that penalizes one or a small number of the current data users to maintain data service throughput.
10. The method of claim 1, wherein monitoring a combined usage of a shared network resource by current voice and data users comprises monitoring usage of forward link spreading codes at a network radio base station.

11. The method of claim 10, wherein reducing the combined usage a desired amount by modifying ongoing service to one or more of the current data users comprises reducing forward link spreading code usage for one or more of the current data users.

12. The method of claim 10, wherein reducing forward link spreading code usage for one or more of the current data users comprises changing a spreading code assignment for each of the one or more current data users from a spreading code in a base set of spreading codes to a spreading code in an extended set of spreading codes.

13. The method claim 1 wherein reducing the combined usage by a desired amount by modifying ongoing service to one or more of the current data users comprises reducing an aggregate usage of the shared network resource by the data users subject to one or more minimum usage constraints such that resources are not released from the current data users in violation of any minimum usage constraint.

14. A method of dynamically prioritizing voice service over data service in a wireless communication network, the method comprising:

monitoring combined usage of a radio base station resource shared by current voice users and data users relative to a resource release threshold; and
if the combined usage meets or exceeds the resource release threshold,
reducing the combined usage by modifying service to one or more of the current data users.

15. The method of claim 14, wherein monitoring the combined usage of the radio base station resource shared by current voice and data users relative to the resource release threshold comprises monitoring the combined usage of a transmit power relative to a power release threshold.

16. The method of claim 15, wherein reducing the combined usage by modifying service to one or more of the current data users comprises reducing the transmit power corresponding to the selected ones of the current data users.

17. The method of claim 16, wherein reducing the transmit power corresponding to the selected ones of the current data users comprises changing an encoding rate of one or more forward link channels associated with the selected ones of the current data users.

18. The method of claim 16, wherein reducing the transmit power corresponding to the selected ones of the current data users comprises, for each selected data user, reducing a maximum allowed transmit power for the selected data user to a level below a current average transmit power being used to support the selected data user.

19. The method of claim 18, wherein reducing the maximum allowed transmit power further comprises reducing a data rate of each of the selected ones of the current data users in association with reducing the transmit powers.
20. The method of claim 16, wherein reducing the transmit power corresponding to the selected ones of the current data users comprises reducing a transmit data rate to each of the selected ones of the current data users.
21. The method of claim 14, further comprising conforming the modification of the one or more transmit parameters for the selected ones of the data users in accordance with any service constraints associated with those data users.
22. The method of claim 21, further comprising excluding any current data users that have one or more service constraints associated with them from consideration for selection as the selected ones of the current data users.
23. The method of claim 14, wherein monitoring combined usage of the radio base station resource shared by current voice and data users relative to the resource release threshold comprises monitoring combined usage of a set of spreading codes shared by current voice and data users relative to a spreading code usage threshold.
24. The method of claim 23, wherein reducing the combined usage by modifying one or more transmit parameters corresponding to selected ones of the current data users comprises changing a spreading code assignment for each of the selected ones of the current data users from a spreading code in a base set of spreading codes to a spreading code in an extended set of spreading codes.

25. The method of claim 14, further comprising selecting the selected ones of the current data users based on ranking them according to a predetermined criteria.
26. The method of claim 25, wherein selecting the selected ones of the current data users comprises selecting one or more of the current data users as targets for resource release based on a rank order of the current data users and a targeted aggregate reduction amount.
27. The method of claim 25, wherein ranking the current data users according to the predetermined criteria comprises ranking the current data users according to an amount of transmit power currently allocated to each of the current data users.
28. The method of claim 26, wherein ranking the current data users according to the predetermined criteria comprises ranking the current data users according to a data rate being used to serve each of the current data users.
29. The method of claim 26, wherein ranking the current data users according to the predetermined criteria comprises determining a transmit power to data rate ratio for each of the current data users and ranking the current data users according to the ratios.
30. The method of claim 14, wherein modifying one or more transmit parameters corresponding to selected ones of the current data users comprises modifying radio configurations of the selected ones.

31. A radio base station comprising:
transmitter circuits to transmit to voice and data users;
a monitoring circuit to monitor combined usage of a radio base station resource shared by current voice and data users relative to a resource release threshold; and
a release controller to reduce the combined usage by modifying one or more transmit parameters corresponding to selected ones of the current data users if the combined usage exceeds the resource release threshold.
32. The radio base station of claim 31, wherein the monitoring circuit is configured to monitor usage of forward link transmit power as the shared resource relative to a power usage level, and wherein the resource controller is configured to modify transmit power as one of the one or more transmit parameters.
33. The radio base station of claim 32, wherein the release controller is configured to reduce the combined usage of the forward link transmit power by reducing an aggregate amount of forward link transmit power allocated to the current data users.
34. The radio base station of claim 33, wherein the release controller is configured to reduce the amount the aggregate amount of forward link transmit power allocated to the current data users by reducing transmit powers of one or more forward link communication channels being used to serve one or more of the current data users.

35. The radio base station of claim 34, wherein radio base station comprises a cdma2000 radio base station, and wherein the release controller is configured to reduce the transmit powers of one or more forward link communication channels being used to serve one or more of the current data users by reducing the transmit power of one or more forward link supplemental channels.

36. The radio base station of claim 35, wherein the release controller is configured to reduce the transmit power of one or more forward link supplemental channels by tracking an average power being used to transmit on each forward link supplemental channel targeted for reduction, and setting a maximum allowed power for the forward link supplemental channel to a level below that average power.

37. The radio base station of claim 35, wherein the release controller is configured to reduce the transmit power of one or more forward link supplemental channels by reducing data rates of the one or more forward link supplemental channels.

38. The radio base station of claim 33, wherein the release controller is configured to reduce the aggregate amount of forward link transmit power allocated to the current data users by reducing data rates on one or more forward link communication channels being used to serve the selected ones of the current data users.

39. The radio base station of claim 33, wherein the release controller is configured to reduce the aggregate amount of forward link transmit power allocated to the current data users by changing radio configurations of one or more of the current data users.

40. The radio base station of claim 31, wherein the monitoring circuit is configured to monitor usage of forward link spreading codes as the shared resource relative to a code allocation level.

41. The radio base station of claim 40, wherein the release controller is configured to reduce the allocation of forward link spreading codes by changing a spreading code assignment for one or more of the current data users from a base set of spreading codes to an extended set of spreading codes.

42. The radio base station of claim 31, wherein the reducing the combined usage by modifying service to one or more of the current data users comprises:

ranking at least a portion of the current data users according to a defined criteria;

and

targeting one or more of the current data users based on rank order for
modification of service to effect a desired amount of reduction.

43. The radio base station of claim 42, wherein the release controller is configured to perform ranking based on determining an efficiency metric associated with serving each current data user on the forward link.

44. The radio base station of claim 42, wherein the release controller is configured to determine the efficiency metric for each current data user based on a power-to-rate ratio of forward link transmit power to forward link data rate, such that the release controller preferentially targets current data users having higher power-to-rate ratios for modification of service.

45. The radio base station of claim 31, wherein the release controller is configured to release to reduce the combined usage by modifying one or more transmit parameters corresponding to selected ones of the current data users subject to one or more minimum usage constraints such that the resource release does not violate any minimum usage requirement associated with the current data users.